

RESEARCH DEPARTMENT

U.H.F. TRANSMITTING AERIAL FOR THE TACOLNESTON TELEVISION STATION

Technological Report No. RA-3/12
UDC 621.396.712 1967/49

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for Head of Research Department

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INTRODUCTION

A u.h.f. transmitting aerial for the Norfolk area has been built as a top-mast on the existing BBC mast at Tacolneston. The station started trade tests on 12th August 1967 and full service on 9th September 1967.

SUMMARY OF INSTALLATION

- Site: The site is 16 km (10 miles) south-south-west of Norwich, grid reference TM/131958, height 70 m (230 ft.) a.o.d.
- Support Structure: The aerial is supported by a 146.3 m (480 ft.) stayed mast of square cross-section with a side of 1.22 m (4 ft.). The mast stays are on bearings of True North and 90°, 180° and 270° E.T.N.
- General Arrangement: See Fig. 1.
- Channels: The aerial is designed to radiate on four channels simultaneously. BBC-2 will be radiated on Channel 55 and BBC-1 on Channel 62. The ITA channels are 59 and 65. All channels have zero offset.
- Aerial: The aerial comprises four tiers, each of four 4λ panels, giving a total radiating length which varies between 16.6λ at Channel 55 to 18.4λ at Channel 65. The panels are offset by 66 mm (2.6 in.) from the centres of the sides of a 660 mm (26 in.) square and are fed with nominally equal amplitude currents in phase rotation. The whole aerial is supported by a load-bearing glass-fibre cylinder of 1.52 m (5 ft.) diameter. Figs. 2 and 3 show the arrangement of the panels inside the glass-fibre cylinder and Fig. 4 shows the construction of each panel.
- The mean height of the aerial is 150.4 m (493 ft. 6 in.).
- Feeders: The arrangement of the distribution feeders is shown schematically in Fig. 5. Each half of the aerial is connected to the transmitters by a feeder type Hackethal HF-6.1/8-50.
- Power: Two 25 kW vision transmitters and two 5 kW sound transmitters have been installed for operation on Channel 55 (BBC-2). The transmitters are run at the power required to give the maximum effective radiated power (e.r.p.) of 250 kW permitted under the Stockholm Agreement.
- Each vision transmitter is combined with a sound transmitter and the combined outputs are paralleled by means of a diplexer. The output of the diplexer is divided equally to the two mainfeeders. This arrangement eliminates effects arising from differences between the modulation characteristics of the vision transmitters.
- A four-channel combining unit will be added later, as required.

Templet and horizontal radiation pattern (h.r.p.):

The h.r.p. was required to be omni-directional with a maximum e.r.p. of 250 kW. The specified tolerance on the h.r.p. uniformity was ± 2.5 dB. The h.r.p.s at the vision carrier frequencies of each operating channel, which are shown in Figs. 6-9, are the mean of measurements on each half aerial.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be null-filled with the maximum of radiation tilted $0.35^\circ \pm 0.1^\circ$ below the horizontal.

The v.r.p.s obtained for each face, shown in Figs. 10-13, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:

Channel	55	59	62	65
	dB	dB	dB	dB
Mean intrinsic gain	13.0	13.2	13.3	13.4
<u>Deduct aerial losses:</u>	dB	dB	dB	dB
Null-filling	0.7	0.7	0.8	0.8
Distribution feeder	0.5	0.5	0.5	0.5
Distribution transformer and load	<u>0.2</u> <u>1.4</u>	<u>0.2</u> <u>1.4</u>	<u>0.2</u> <u>1.5</u>	<u>0.2</u> <u>1.5</u>
Mean net gain	11.6	11.8	11.8	11.9
<u>Deduct other losses:</u>				
Main feeder	1.0	1.0	1.0	1.0
Feeder ground run	0.2	0.2	0.2	0.2
Diplexer and splitter	<u>0.1</u> <u>1.3</u>	<u>0.1</u> <u>1.3</u>	<u>0.1</u> <u>1.3</u>	<u>0.1</u> <u>1.3</u>
Mean effective gain	10.3	10.5	10.5	10.6
H.r.p. maximum/mean ratio	2.4	2.3	2.5	3.0
Maximum effective gain	12.7	12.8	13.0	13.6

Programme feed:

Initially, direct pick-up of Belmont using Associated Aerials Double 18-element Yagi mounted at 116.4 m (382 ft.).

Later, G.P.O. link.

ACKNOWLEDGEMENTS

The mechanical and electrical design, construction and setting-to-work of the aerial were carried out by the Marconi Company. The contracting authority was the BBC Transmitter Planning and Installation Department.

JMP

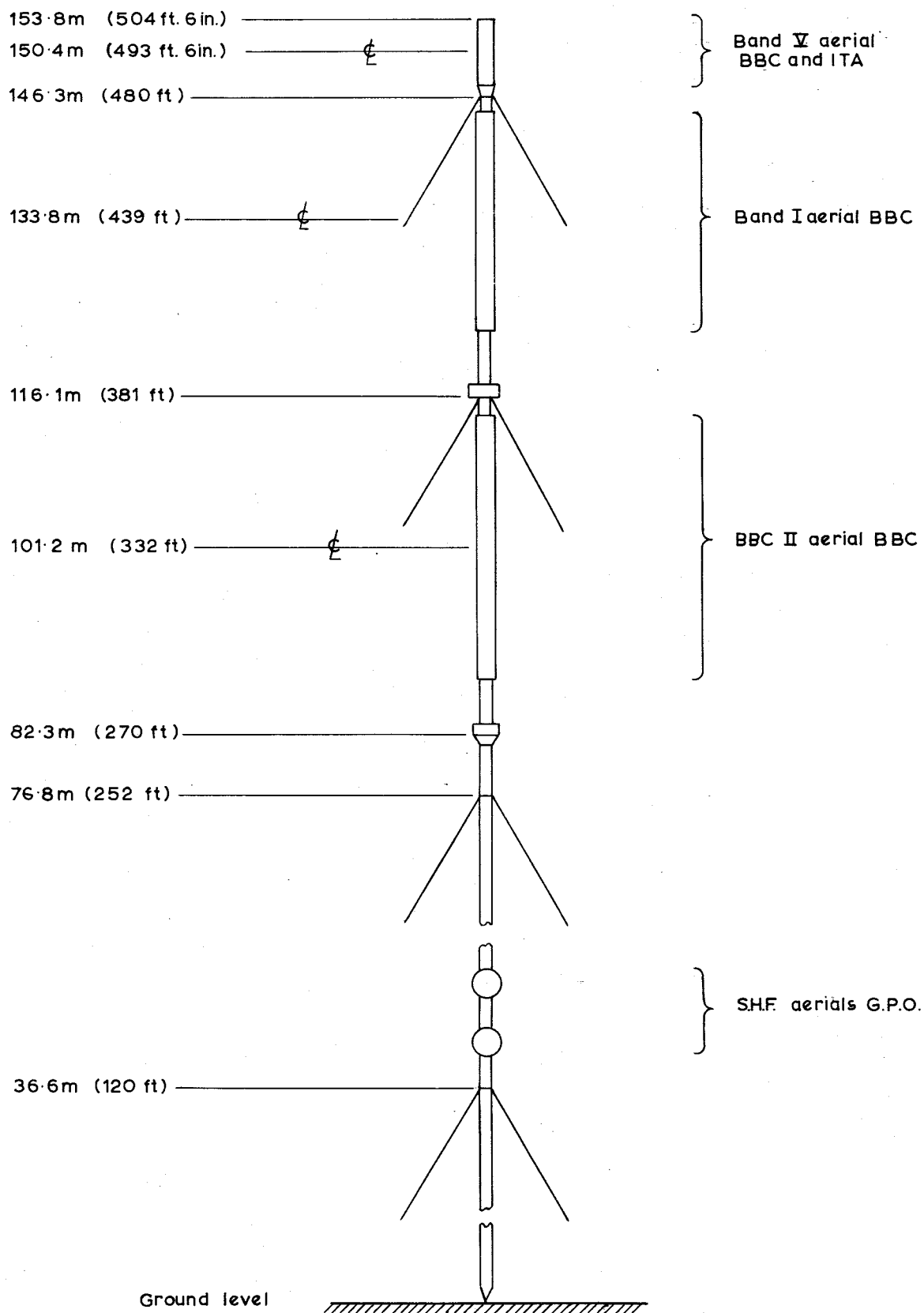


Fig. 1. General arrangement of aerials on mast.

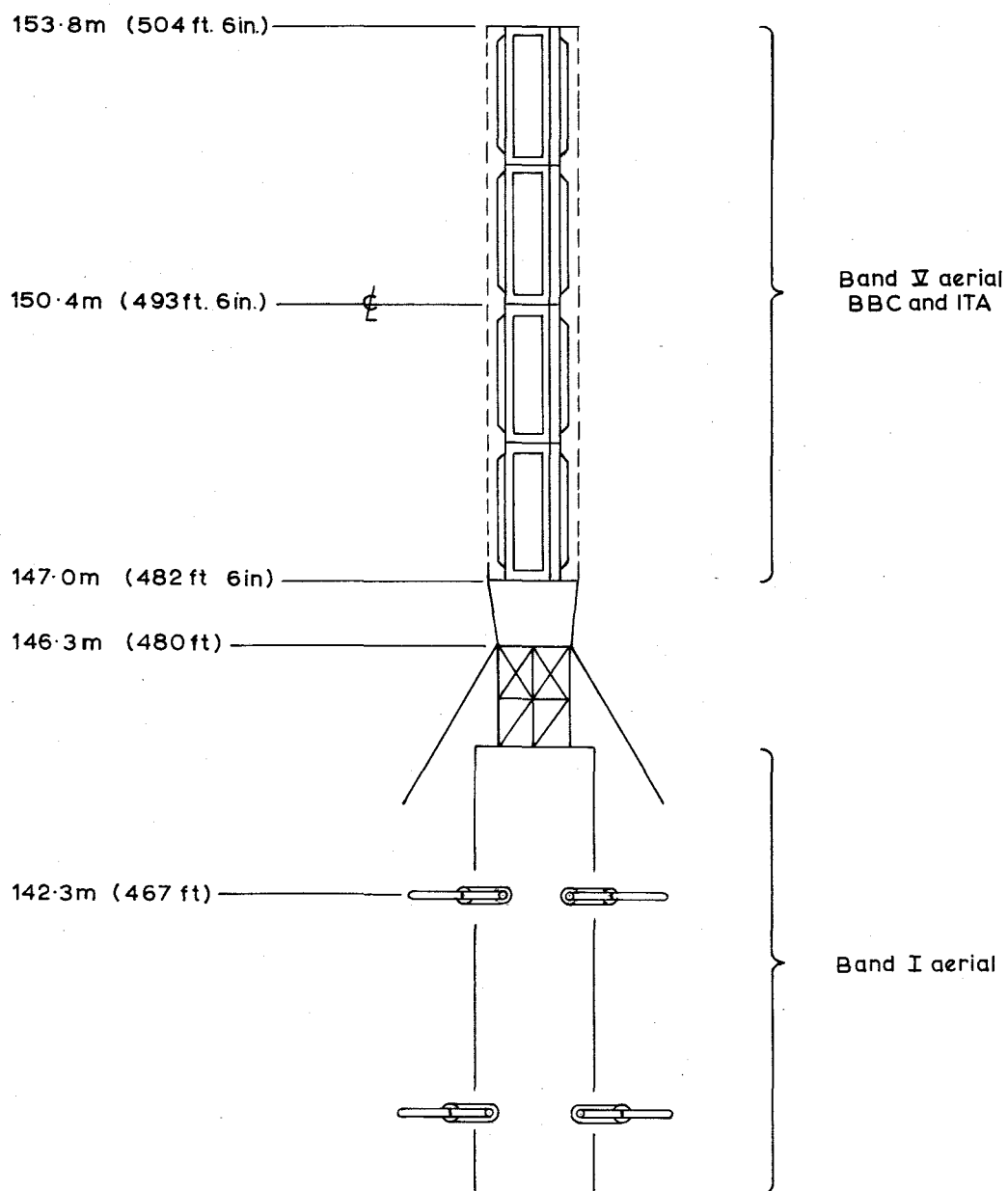


Fig. 2. Elevation of aerial.

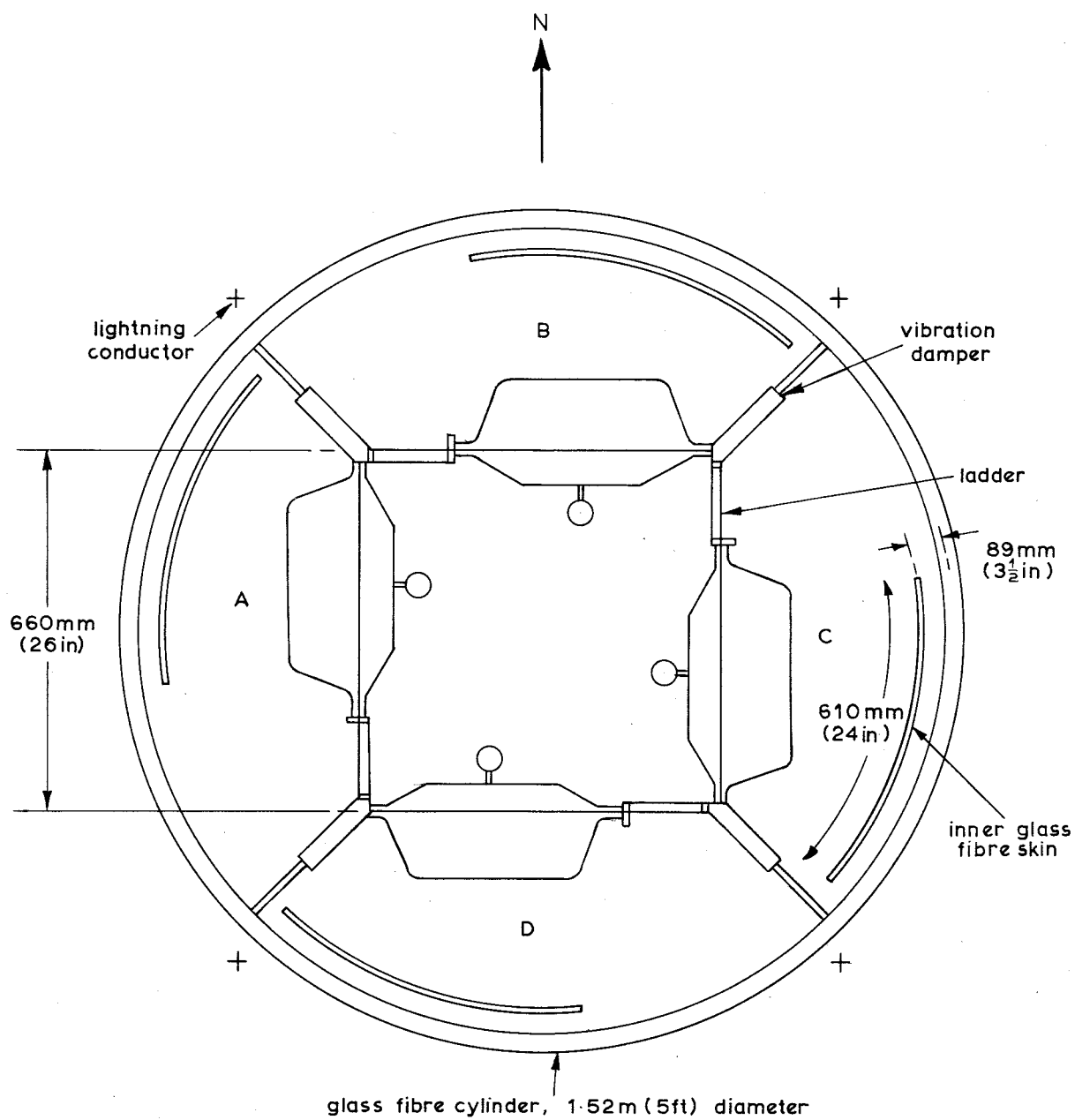


Fig. 3. Plan of aerial.

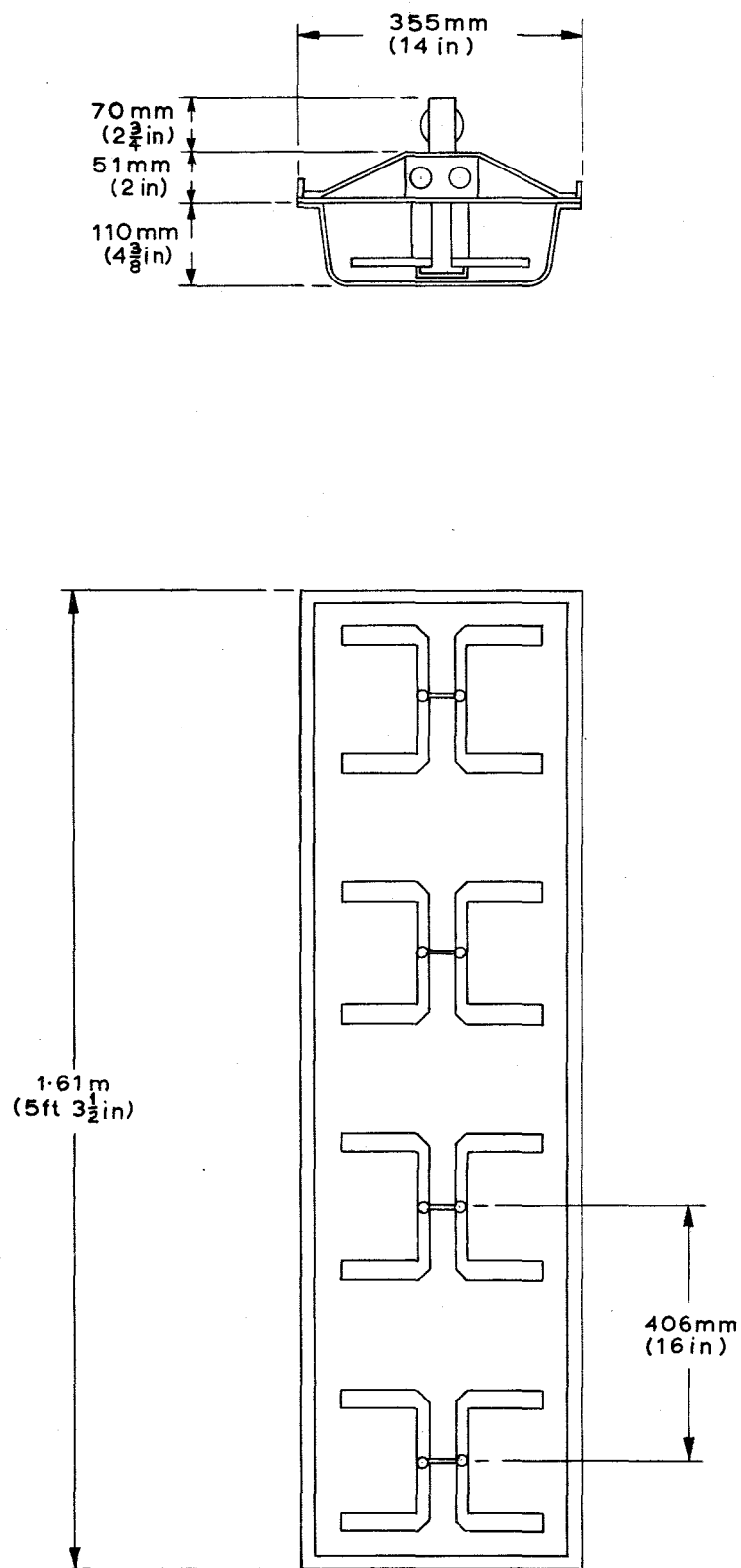


Fig. 4. Construction of single panel.

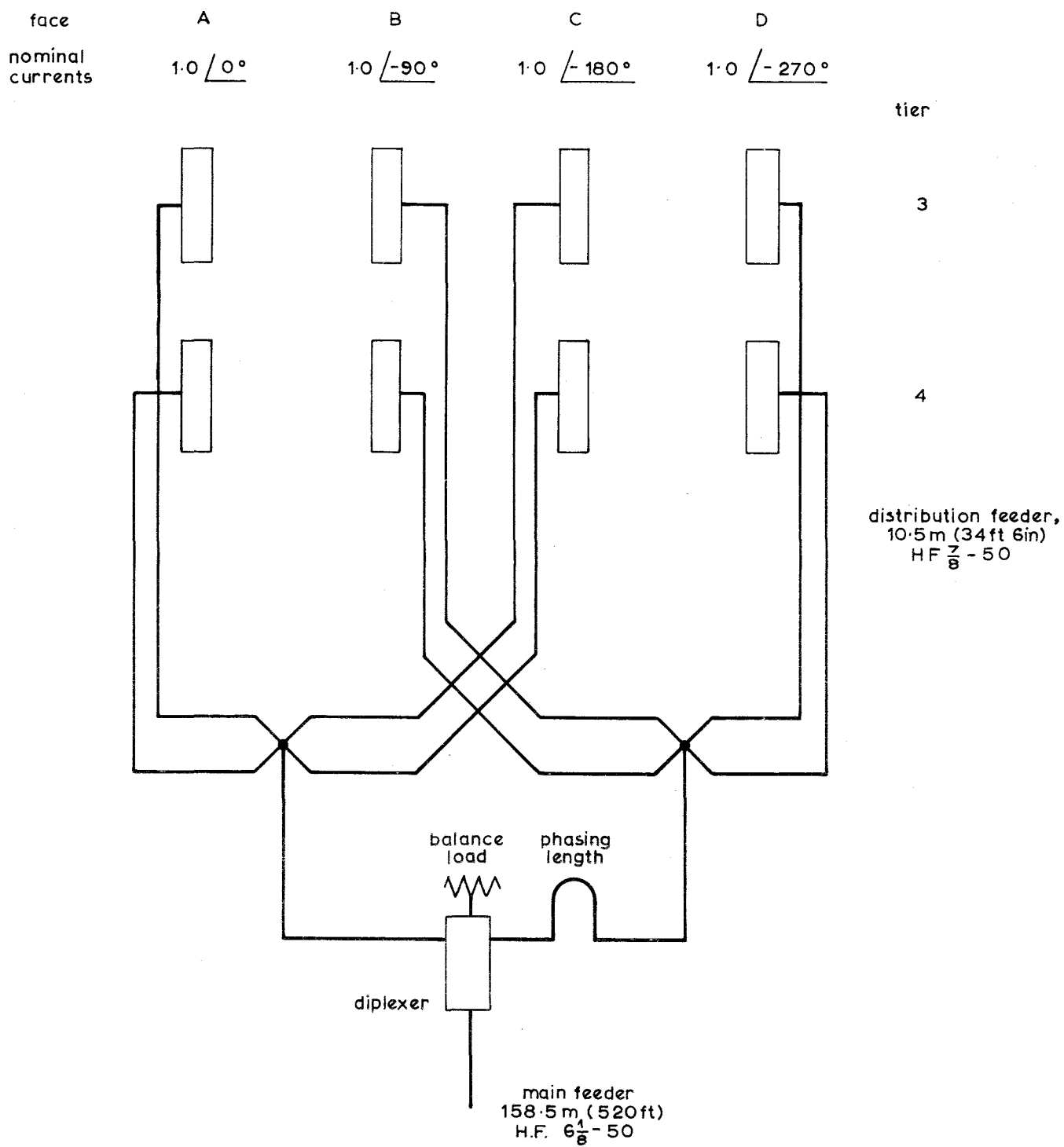


Fig. 5. Schematic of distribution feeder arrangement (lower half aerial)

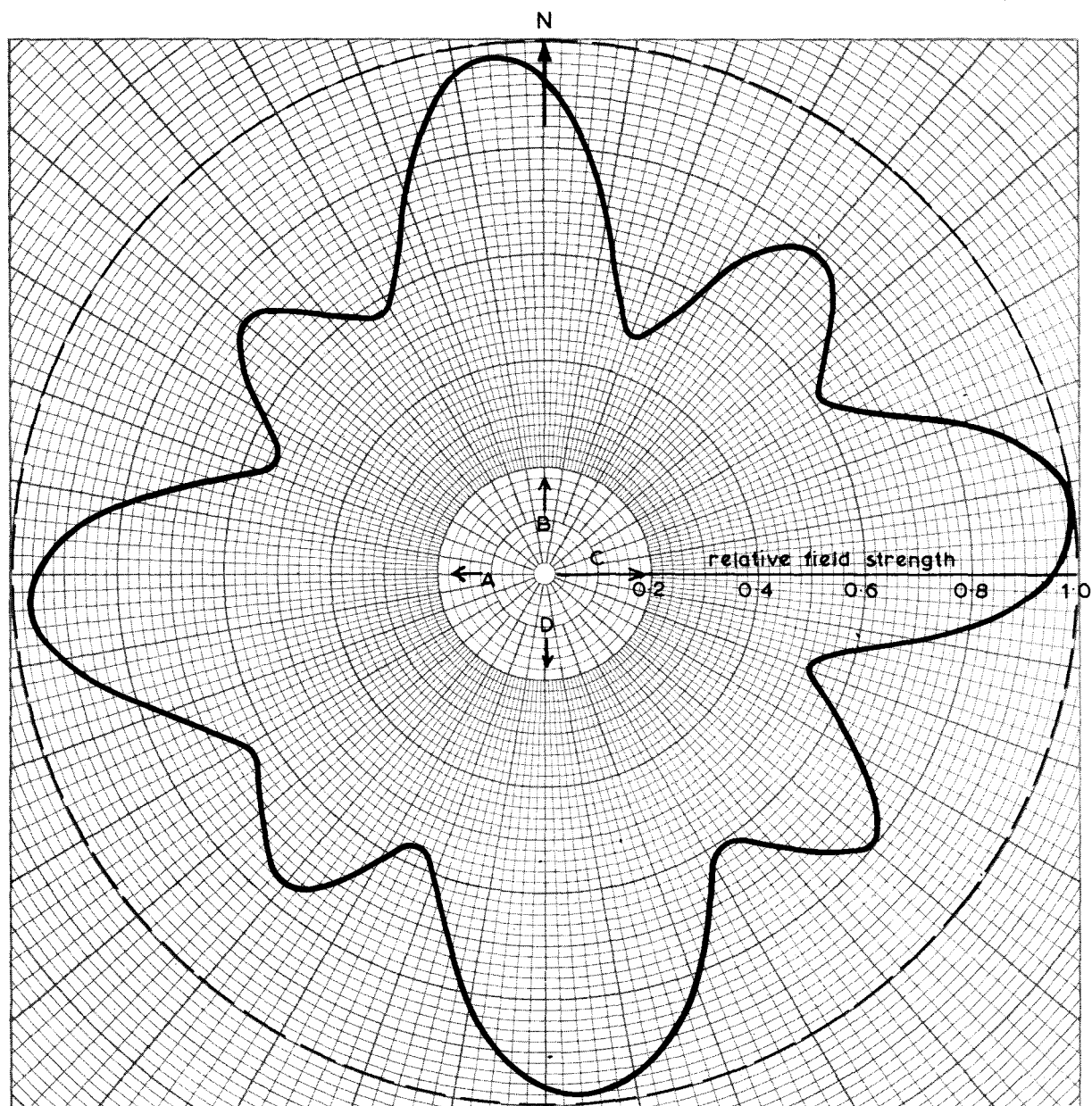


Fig. 6. Horizontal radiation pattern: Channel 55 (BBC 2)

HORIZONTAL POLARIZATION

Vision carrier 743.25 MHz, Sound carrier 749.25 MHz

Mean effective gain: 10.3 dB

Peak vision transmitter power: 2 x 7 kW

Mean E.R.P.: 145 kW

———— Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 250 kW

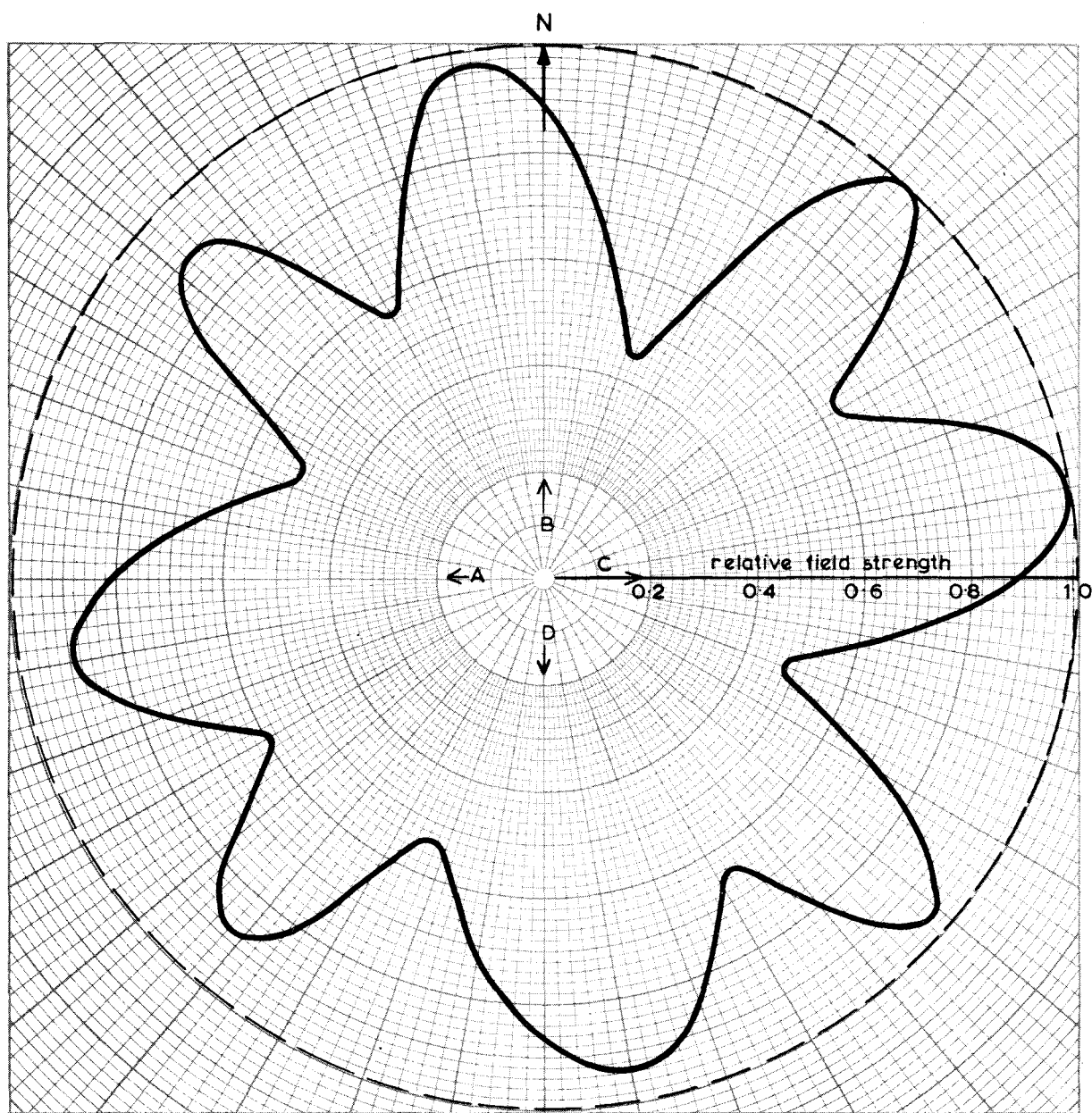


Fig. 7. Horizontal radiation pattern: Channel 59
HORIZONTAL POLARIZATION

Vision carrier 775.25 MHz, Sound carrier 781.25 MHz

Mean effective gain: 10.5 dB

Peak vision transmitter power: 2x6.5kW

Mean E.R.P. 150 kW

———— Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 250 kW

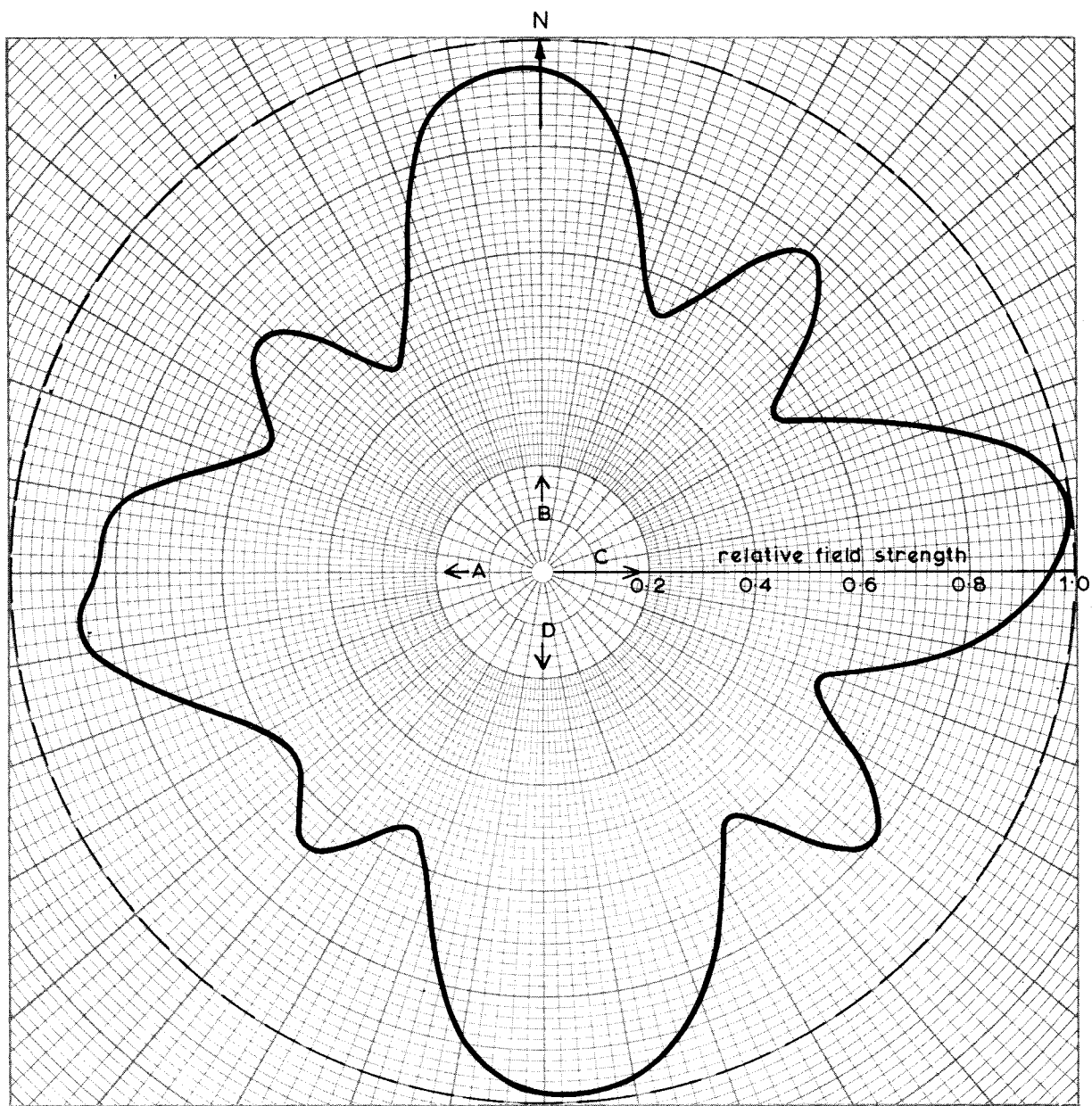


Fig. 8. Horizontal radiation pattern: Channel 62 (BBC1)

HORIZONTAL POLARIZATION

Vision carrier 799.25 MHz, Sound carrier 805.25 MHz.

Mean effective gain: 10.5 dB

Peak vision transmitter power: 2 x 6.0 kW

Mean E.R.P. 140 kW

— — — — — Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 250 kW

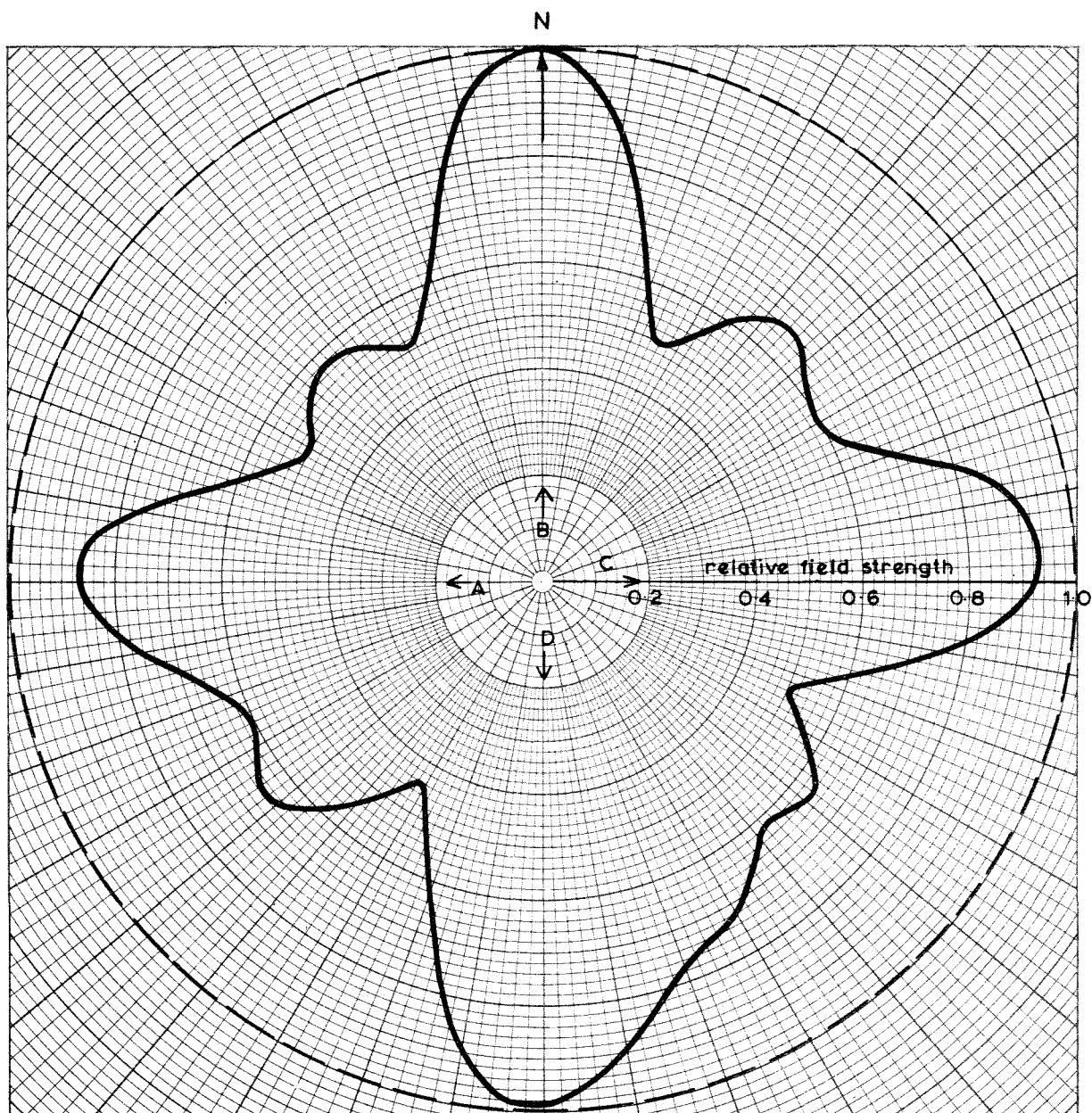


Fig. 9. Horizontal radiation pattern: Channel 65

HORIZONTAL POLARIZATION

Vision carrier 823.25 MHz, Sound carrier 829.25 MHz

Mean effective gain: 10.6 dB

Peak vision transmitter power: 2×5.5 kW

Mean E.R.P.: 125 kW

— — — Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 250 kW

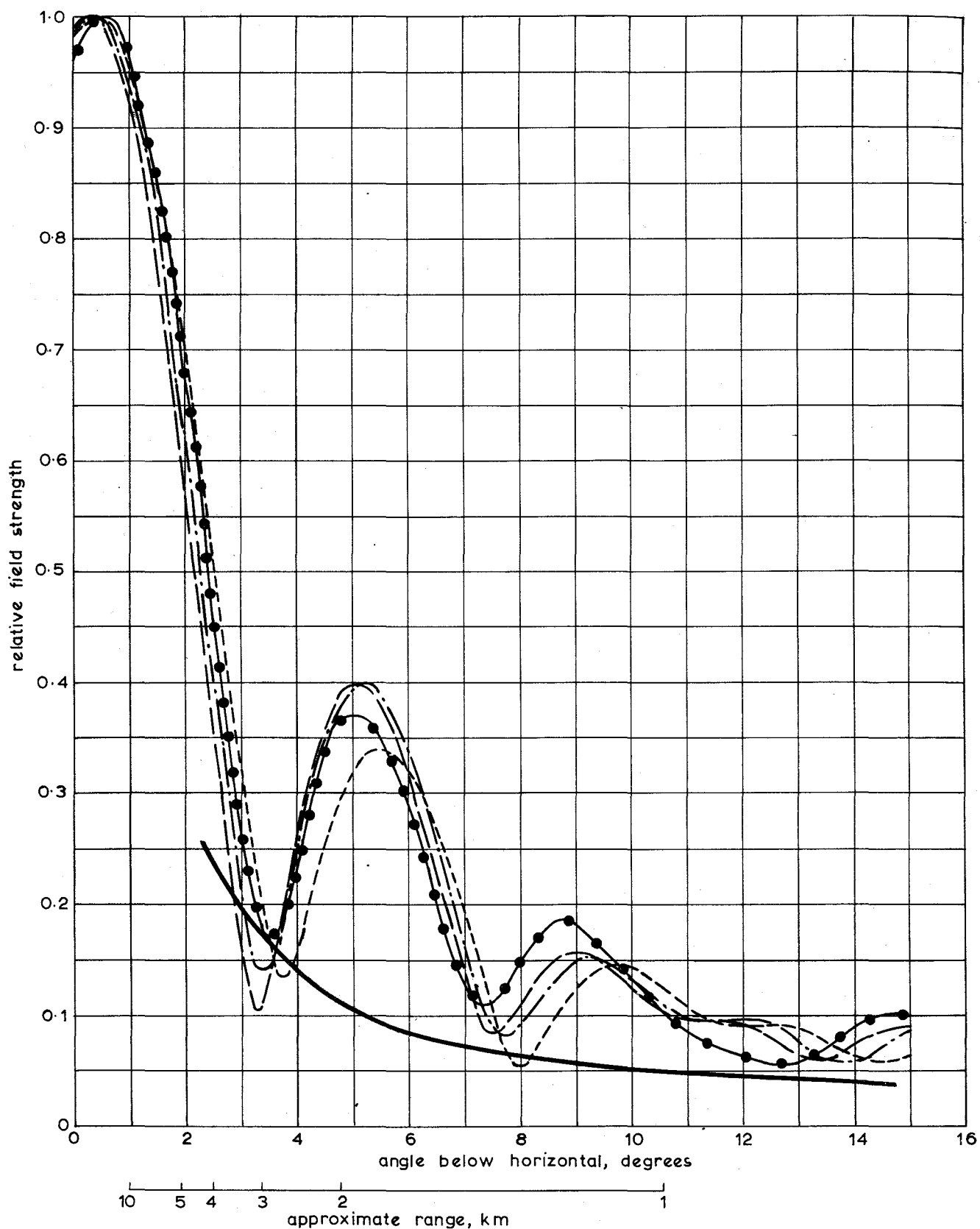


Fig.10. Vertical radiation pattern on bearing 270° E T N (face A)

- - - - - Channel 55 (BBC 2) - · - · - Channel 59
 ——— Channel 62 (BBC 1) ····· Channel 65
 ————— Specified minimum field

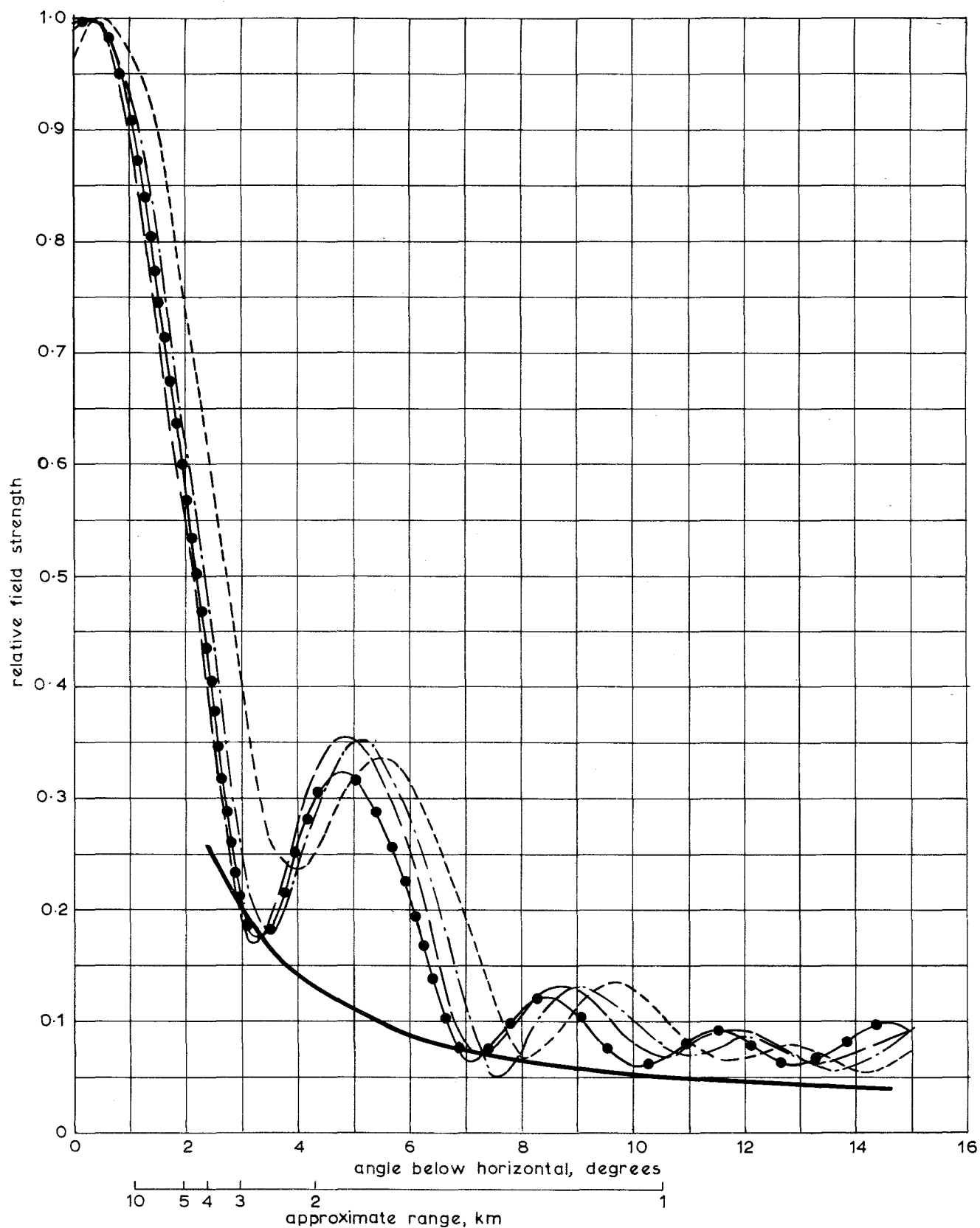


Fig. 11. Vertical radiation pattern on bearing 0° E T N (face B)

----- Channel 55 (BBC 2) - - - - - Channel 59
 ----- Channel 62 (BBC 1) ••••• Channel 65
 _____ Specified minimum field

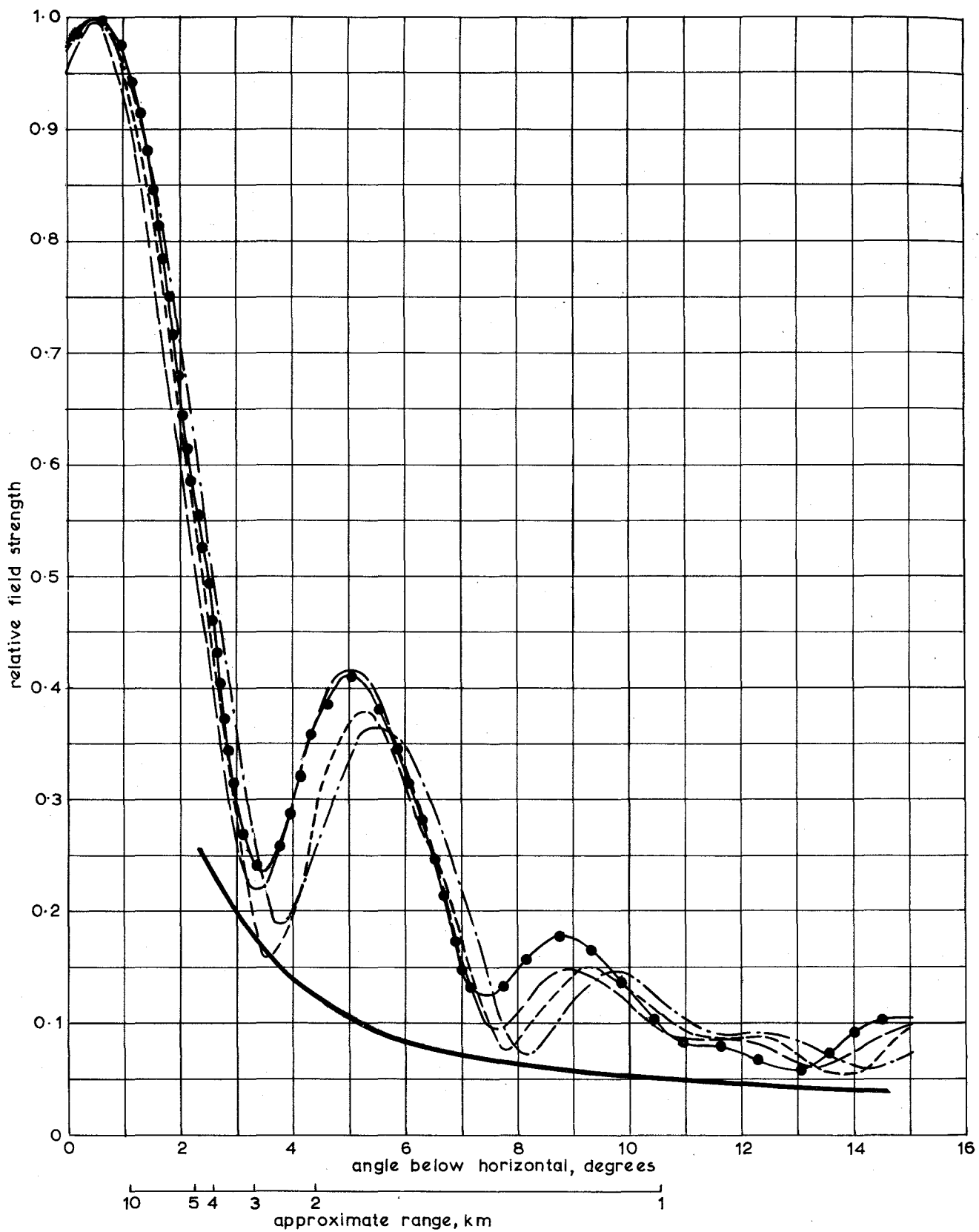


Fig. 12. Vertical radiation pattern on bearing 90° E T N (face C)

- - - - - Channel 55 (BBC 2) - · - · - Channel 59
 - - - - - Channel 62 (BBC 1) · - · - · Channel 65
 ————— Specified minimum field.

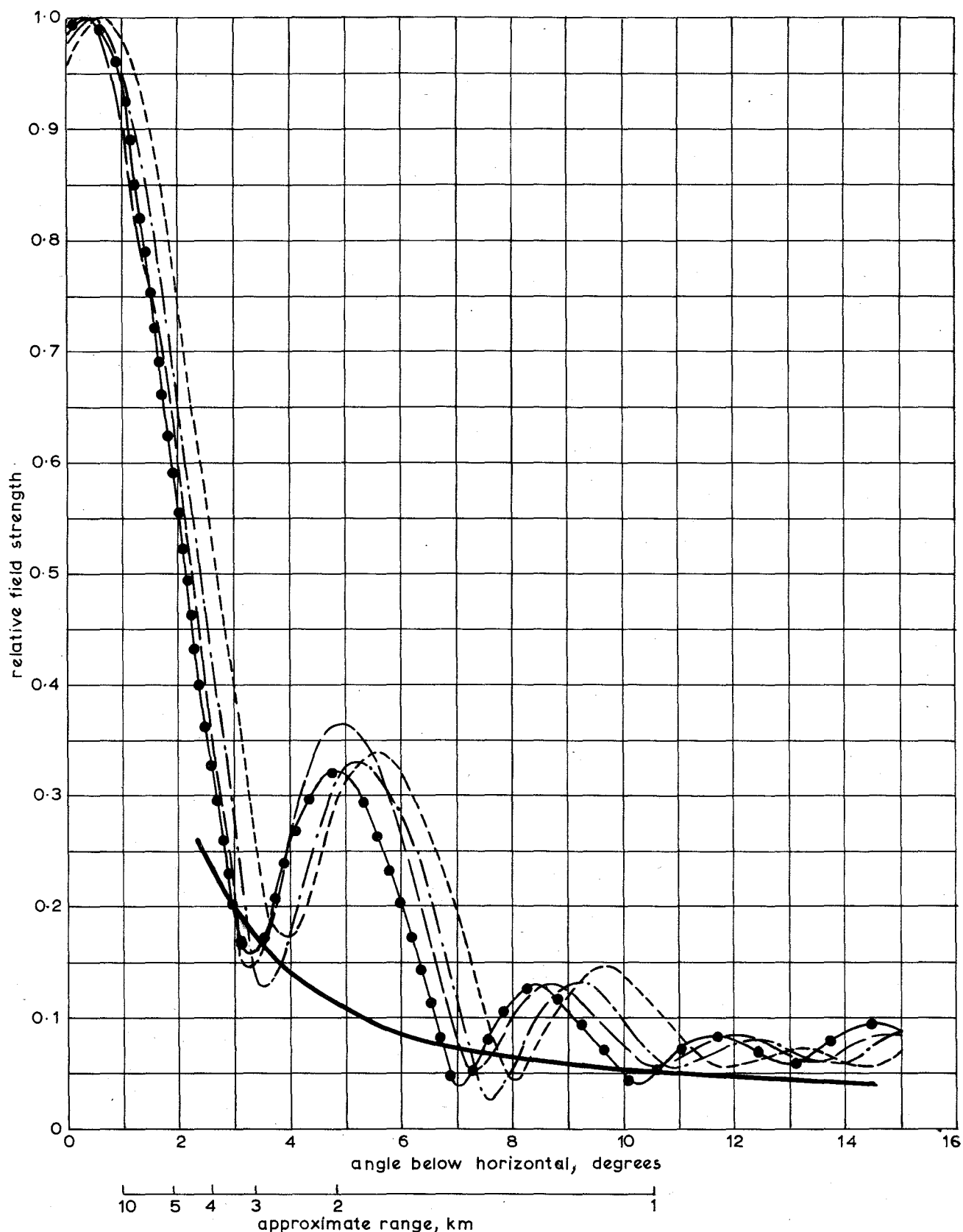


Fig. 13. Vertical radiation pattern on bearing 180° E T N (face D)

----- Channel 55 (BBC 2) - · - · - Channel 59
 ————— Channel 62 (BBC 1) ····· Channel 65
 ————— Specified minimum field